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The Cost and Performance of Paid Agicultural Extension Services

The Case of Agricultural Technology Transfer in Nicaragua

Experience in Nicaragua with paid extension services — also known as private, commercial, or co-financed extension services — shows that even poor farmers are willing to pay for a service that improves their economic efficiency and ability to earn a living.

Ariel Dinar
Gabriel Keynan

The World Bank
Latin America and the Caribbean Region
Sector Leadership Group
and
Rural Development Department
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Summary findings

Budgets for extension services have been reduced in many countries. One response to these reductions in public services in some countries has been to privatize extension services — with extension services provided, for a fee, by either public agencies or private companies. Under the new approach, producers become clients instead of beneficiaries.

Dinar and Keynan examine ways to measure the cost of providing paid-extension services and its performance and apply these indicators to data on Nicaragua, where paid extension has existed for several years.

Data were insufficient to compare the quality of privately and publicly provided extension services, but available data suggest that the costs of extension have declined over time. Results suggest that paid extension is feasible and has a positive impact, even in a relatively poor country such as Nicaragua. The national system for agricultural technology-transfer services was redesigned to include three main modules:

- Mass media and free demonstrations.
- Cofinanced extension services.
- Private extension services.

The relatively high cost recovery rates in Nicaragua and the economic performance of the two paid programs show that even poor farmers are willing to pay for a service that improves their economic efficiency and ability to earn a living. To the surprise of everyone involved, Nicaragua's producer clients understood that without cost-sharing, the system would not endure.

This paper — a joint product of the Sector Leadership Group, Latin America and the Caribbean Region, and the Rural Development Department — is part of a larger effort in the Bank to implement policies in the context of the Agricultural Technology and Land Management Project in Nicaragua. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Fulvia Toppin, room S8-220, telephone 202-473-0450, fax 202-522-1142, Internet address ftoppin@worldbank.org. The authors may be contacted at adinar@worldbank.org and gkey@actcom.co.il. June 1998. (37 pages)

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THE COST AND PERFORMANCE OF PAID AGRICULTURAL EXTENSION SERVICES

The Case of Agricultural Technology Transfer in Nicaragua

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MEASURING THE COST AND SOME PERFORMANCE INDICATORS OF PAID-EXTENSION

The Case of Agricultural Technology Transfer in Nicaragua

Introduction

Public Agricultural Extension (Extension), like many other public services, is at cross roads. Extension was also criticized for inefficiency and in some cases for irrelevancy (Rivera 1996a). Lately, public budgets for extension activities in many countries were drastically cut and the scope of the extension work was reduced or modified. Structural changes in extension provision and financing alternatives have been one type of response to the changes in the environment in which extension in now operating throughout the world. Terms such as private extension, paid-extension, commercialized extension, and co-financed extension, are used to express the emergence of a service that is provided, either by public agencies or by private companies, for a fee. We will use here the term "paid-extension" to describe these versions.

There are several experiences of paid-extension experiences around the world, which are reported in the literature. They differ and each case corresponds to the local physical, economic and institutional conditions under which the agriculture sector operates. They are also designed to meet the capacity of the farmers (producers) to co-finance the costs of the service. Payment by producers for extension services have been implemented in varying degrees in a number of developed and developing countries. A detailed description of these cases can be found in Keynan et al. (1997).

Arrangements for paid extension, as they are reported in the literature, include (see Keynan et al., 1997): (a) direct contracts between governments or municipalities and private consultants to provide extension for a limited period (Nicaragua). This mode also includes payment rates that depend on producers' income level (Chile, Mexico, Colombia); (b) direct agreements between producers and extensionists where payment is calculated in terms of crop or profit share (Ecuador); (c) tradable extension vouchers that are funded and awarded to low income producers by government, based on certain criteria, and are redeemed by the extensionists upon provision of the service (Costa Rica); (d) direct contracts between groups of producers and extensionists and other experts (Argentina, China); (e) a combination of funding via direct payment by producers, contribution by agricultural organizations, and direct and indirect taxes (France); (f) charge on a

time-cost basis for certain services (United Kingdom); and (g) negotiated lump-sum per an agreed project-based activity by the extensionist (Queensland, Australia).

Most of the existing studies provide information on the structure and operation of the different paid-extension arrangements, and, in some cases also some anecdotal results on the costs and benefits associated with these operations. However, there is not enough evidence and analysis that can help the reader in reaching a conclusion on the degree of success of certain paid extension arrangements.

The literature includes several studies that address the economic aspects of paid-extension. Hone (1991), in a theoretical analysis attempts to estimate the implications of recent use of direct charges to finance various rural extension networks in Australia. Dinar (1996) applies an approach that determines how much to charge for extension services, using an illustrative example from Israel. Schwartz (1994) reviews several concepts (amended by case study analysis), such as public vs. private goods, information transfer, and externalities, which are associated with paid-extension.

However, several questions still remain to be answered. For example, can one arrangement for paid-extension that was successfully experienced in one country be duplicated in another country? How does one select the appropriate paid-extension arrangement for a given set of conditions? These questions suggest that a methodology to compare between different paid-extension arrangements, is desirable.[1]

This paper develops a framework for comparing the cost and several performance indicators of various paid-extension programs by using actual data from two types of paid-extension programs in Nicaragua, and assessing their performance.[2] The analysis focuses on selected performance indicators and their application using available data from the experience in Nicaragua. The next section develops a framework for comparison between the two types of paid-extension.

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[1] The debate on public vs. private extension continues to rage among experts in the field. The debate includes issues such as should extension be publicly funded? Who should pay and how much should be paid for extension services, and which segments in the farming population can afford to pay for extension? (See Cary, 1993; Schwartz, 1994; and Rivera, 1996a,b). Although significant, this debate is beyond the scope of this paper.

[2] The purpose of this paper is not to evaluate the paid-extension performance in Nicaragua but rather to illustrate, using available data from Nicaragua, the application of the indicators developed in the paper.

Then in the third section the two systems of paid-extension in Nicaragua are described. Section four applies the analytical framework to available data from two private extension programs in Nicaragua. The paper is concluded with suggestions for policy and directions of future research.

A Conceptual Framework for Comparing Paid-Extension Performance

In evaluating the performance of paid-extension, two comparisons have to be addressed. First, a comparison between paid-extension and public extension performances and second, a comparison among alternative paid-extension programs. Although the analysis should not be detached from the objectives for which paid-extension was initiated on the first place, there are several basic economic rules that should always hold.

Extension inputs and outcomes of public extension services can be measured in many ways. They can be measured in monetary terms such as expenditures on fuel, salaries, and training, and in physical terms, such as number of extensionists or extensionist man-hour employed in the program. Extension output also can be measured in a variety of ways, including the number of farmers contacted by extensionists, farmers' participation in extension activities, changes in agricultural practices due to the provision of extension, improved farm-level physical performance (yields, crop varieties, inputs), and increased farm-level profitability. In the case of private extension, there is also a need to compare between private and public expenditures on extension. We distinguish among four categories of analysis: individual producer level analysis, agency-level analysis, government-level analysis, and social-level analysis. In the following sections we provide a detailed analytical framework for each category, which in turn is the basis for measuring the cost and some performance indicators of paid-extension in Nicaragua.

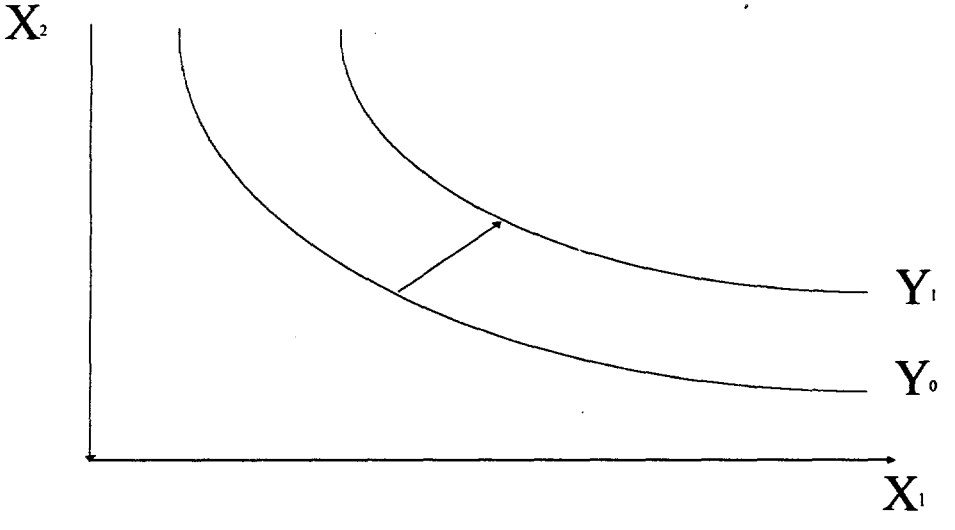
Individual producers

The impact of paid-extension on individual producers can be estimated in several ways, compared to performance at the no-extension or at the public extension stage. First, by improving technical efficiency, where increase in profit at any given combination of other inputs X_1 and X_2 is observed (Figure 1). Second, by improving allocative efficiency, where at a given technical efficiency extension increases profits due to a better economic allocation of scarce inputs X_1 and X_2 (see Figure 2).

In Figure 1 the extension impact is measured by the ability to move from production isoquant Y_0 to production isoquant Y_1 ($Y_1 > Y_0$). In this model the difference between Y_1 and Y_0 may be due to increased yield, or increased revenue (resulting from improved yield quality).

Figure 2 demonstrates how a producer that uses a_1 units of X_1 and a_2 units of X_2 to produce Y can be better off by moving to the left on the production isoquant Y and producing the same quantity Y by a more economic combination of X_1 and X_2. By realizing the price ratio between the two inputs, the producer uses now b_1 units of X_1 and b_2 units of X_2. Extension contribution is translated into the introduction of cultivation or management techniques that allow the combination b_1-b_2.

Figure 1: Improving technical efficiency



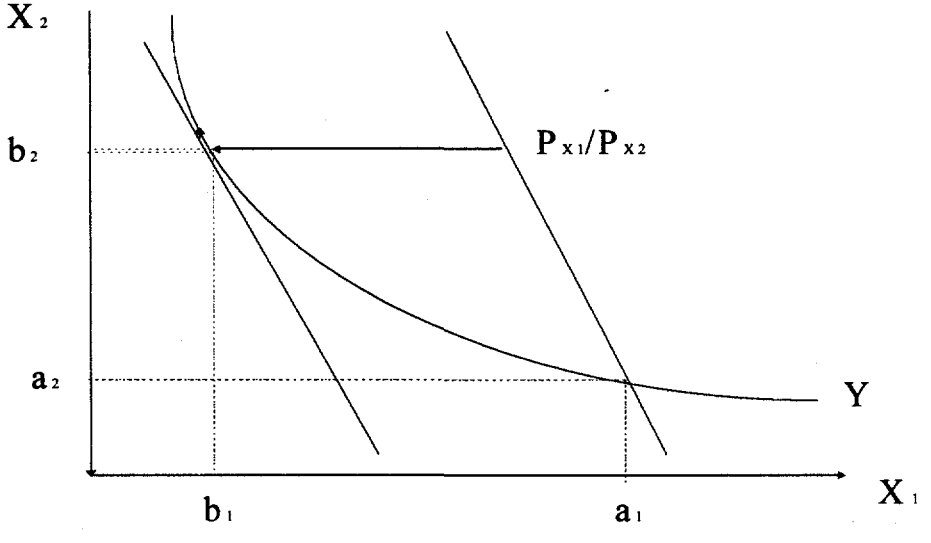
The bottom line in the individual-producer analysis is to maximize the private net benefit value. In a simplistic way a comparison between public and paid extension is measured by the following condition

[1] $$A^{12} - B^{12} - C^{12} \geq A^{b} - B^{b}$$

where A is revenue from agricultural product, B is direct production cost, and C is private payment for extension services. The index "b" stands for public extension and the index "12" stands for paid-extension. A simple measure for A - B might be an aggregation of crop level performances.[3]

In the case of paid-extension, distinction has to be made between the agency/company-level analysis and the government-level analysis, where the objectives can differ widely.

Figure 2: Improving allocative Efficiency



Agency/company level[4]

The objective of the private agency/company that provides extension services is to maximize profits, or to minimize costs. This is the case when the company is provided by the government with a fixed allowance per producer. Governments may regulate private extension to ensure certain service provision standards. For example, governments could insist that private companies

[3] Crop level cost-revenue analysis is probably the most convenient approach, and it is used in many cases in the literature.

[4] In the case of ATP1 this is the local INTA agency, and in the case of ATP2 it is the private company.

provide some financial outlays for training of producers. (A comparative analysis of the private companies' financial performance may provide the different spending patterns.)

Government expenses

When considering a move from public to private service provision, the government main objective is to cut costs. When privatizing a service, governments might be less motivated by the objective of improving the performance of the recipient (producer) although this outcome is also expected. Therefore, from the government's point of view

$$[2] \qquad \sum_{i=1}^{N} D_i + F \leq E^P$$

where D_i is direct payment by government to private extension company i (i=1,...,N), F is government monitoring and coordinating cost of the private extension companies, and E^P is government cost of public extension.

Social analysis

It is also desirable to compare social benefits in the case of public and paid-extension. In a benefit-cost analysis framework it is expected that, from a social point of view, society is doing the same or more with less resources. There is a danger, though, of comparing very small levels of performance in public and paid-extension. One should, therefore, take into account the private as well as the social costs and benefits associated with the privatization of the service. A simple approach would calculate private-level cost-benefit ratios of paid-extension, and then estimate the additional, if any, social cost associated with paid-extension. For example, social cost may include the government payment to private companies (in addition to the farmer payments). Social cost may also include the opportunity cost associated with the change in clientele as paid-extension takes place. As was suggested in Dinar (1996), and was also observed in the case of privatization in the United Kingdom (Dancey, 1993), traditional clientele of public extension do not get the same extension or any extension services when public extension is privatized. The so-

cial objective would be to minimize the differences between private and social B/C ratios. It is understandable that in the case of extension, private benefit-cost ratio is different than the social one.

[3] $$\left|(B/C)_p^{12} - (B/C)_s^{12}\right| \to \varepsilon$$

where B/C is benefit cost ratio, p stands for "private", s stands for "social" and ε is a small number. And

[4] $$(B/C)_s^{12} = B \Big/ \left(\sum_{i=1}^{N} D_i + F + \sum_{i=1}^{N}\sum_{j=1}^{M} P_{ij} + \sum_{i=1}^{N}\sum_{j=1}^{M} \Delta G_{ij} + \Delta L \right)$$

where P_{ij} is payments by producer j to firm i, and ΔG_{ij} is additional production cost of producer j working with private firm i. ΔL is opportunity cost of producers abandoned by extension in the moves from public to private extension. ΔL can be measured as the loss in income by those producers, or as the additional funds the government has to allocate to provide other means of extension to producers that were abandoned (such as pamphlets, radio programs, field demonstrations etc...).

Paid-Extension in Nicaragua

Agriculture is an important sector in Nicaragua, contributing nearly 25% of the GDP and employing about 33% of the labor force (Banco Central de Nicaragua, 1997). Table 1 presents GDP figures for the period 1990-1997, from which it is apparent that agricultural contribution to the national GDP is steadily increasing between 1990 and 1996. The increased importance of the agricultural sector in Nicaragua's economy further justifies the important role extension services may play in the country.

Detailed description of the evolution of public agricultural extension in Nicaragua since 1942 can be found in Keynan et al. (1997). The last restructuring of the extension services, created the *Instituto Nicaragüense de Tecnologia Agropecuaria* (INTA)[5] in 1993, which brought agricultural and livestock research and extension under one roof. INTA is divided geographically into five regions with its headquarters in Managua. The regions are all located in the western (Pacific) and central parts of the country where there is a larger concentration of economic and agricultural activity.

In 1995, INTA employed about 160 extensionists (INTA, 1996), serving nearly 21,500 producers in its five regions[6], under the Assistencia Tecnica Publica-basico (ATPb) program. A large portion of INTA's budget is funded by foreign sources. In the same year, the national budget was reduced, and INTA's management began to realize that donors' support for public research and extension services was waning. Under these conditions, it became obvious to INTA that serious efforts should be made to use existing international assistance in order to establish a decentralized, client-oriented, accountable, and efficient extension system. In this context, it was also clear that such a system would be sustainable only with the finance commitment of the producers. Under the new approach, producers became clients instead of beneficiaries. To the surprise of all involved, these clients understood that without their sharing of costs, the system would not endure. Under these circumstances, the national agricultural technology transfer services were re-designed to include, three main modules for service provision: mass media and demonstration free of charge (ATPb); co-financed (Assistencia Tecnica Publica Cofinanciada-ATP1); and private (Assistencia Tecnica Privada-ATP2). While the first two are provided by INTA's staff, the third is carried out by private extension firms. At this stage ATP1 and ATP2 are still subsidized by INTA.

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[5] INTA's mandate is to reach small and medium farmers. These include some 170,000 out of a total of 243,000 rural families.

[6] However, based on FIDEG (1995) 0nly 8.1% of the 313,845 farmers in Nicaragua received extension of any kind from any source. Of the 8.1% receiving extension, 24.1% (6126) were served by INTA. This discrepancy is explained by improper documentation of producers served by INTA prior to the 1993 reorganization. For example, INTA's 1997 budget targets 26,000 producers through ATPb and over 5,000 producers through ATP1. Additional 15,000 producers are targeted via ATP2.

Table 1: Total and agricultural GDP in Nicaragua 1990-1996.

	1990	1991	1992	1993	1994	1995	1996
Total GDP[a]	18156.2	18127.3	18202.2	18135.9	18742.8	19580.0	20648.2
Agricultural GDP[a]	4495.3	4420.3	4452.3	4533.4	5021.2	5299.6	5817.4
Share of Agricultural GDP (%)	25.0	24.3	24.4	25.0	26.8	27.0	28.2
Exchange rate	140.92[b]	4.27	5.00	5.62	6.72	7.55	8.44

[a]Millions of 1980 Cordobas.

[b]A monetary reform in 1988 affected the local currency exchange rate compared to the $US.

Source: For GDP, Banco Central de Nicaragua (1997).

For Exchange Rate, IMF (December, 1997)

Scrutiny of the INTA's 1997 budget of $US 9.09 million[7] budget (INTA, 1997a) reveals that the total budget consisted of the following: 70.0% public funds, including a loan from the World Bank which accounted for 30 % of this total; 26% in foreign contributions; and 3.3% proceeds of the sale of products and services. The total number of producers reached by all three INTA's programs remained 21,500, so the average expected cost of extension provision per producer is about $US 423.[8] Of the entire $US 9.09 million budget, about 12% is allocated to activities that provide extension services to more than half of the producers that are approached by INTA. However, ATPb is not the subject of the investigation of this paper. Scrutiny of the INTA's 1998 budget of $US 11.01 million[9] the total budget consisted of of the following: 74.6% public funds; 23% in foreign contributions; and 2.4% proceeds of the sale of products and services. It should be emphasized that INTA's budget does not include payments from producers

[7] In June 1997 9.20 Cordobas = 1$US.

[8] For comparison, figures in Tacken (1997) for the private extension service in the Netherlands, suggest a range of extension provision cost per farmer between $US1360 and $US1590 for the period 1993 and 1996 (exchange rate of 1.7Dfl per $US1 was used). During this period, proceeds from producers range from 26% to 63% of the operating cost of the service. Although the cost of $423 in Nicaragua is lower than that in the Netherlands, it still should be viewed in the right perspective. The $423 value is the total budgeted cost, including the overhead of the coordinating units of INTA in Managua. This value is obviously higher than the direct cost of extension provision by ATP1 or ATP2, as is calculated later in the paper.

[9] In November 1997 9.85 Cordobas = 1$US.

participating in ATP1 and ATP2 programs. These payments go directly to extensionists and to private firms, who provide producers with contracted extension services.

The Co-financed Public Technology Transfer Service (ATP1)

One of the main objectives of the ATP1 was to improve the effectiveness of public extension in Nicaragua. Public extension suffered from a lack of accountability, and from absence of monetary incentives to produce results. The philosophy of ATP1 is to link the extensionists directly to their clients, making them accountable for results. Good results would be rewarded; poor results would affect both income and personal status as the results become publicly known. The major mechanism applied was the payment of a small sum by the producer for an agreed service. Payment would be made to the technician and not to the institution, and would be divided among those providing the service, including supervisors and support staff. The agreement with the producers included the setting of agreed quantitative objectives in terms of crop yields to be achieved by the technical assistance provided by the extensionist. Both the extensionist and the institution were obliged, through this mechanism, to strive to achieve good results. A detailed description of the establishment and phasing in of the ATP1 program in Nicaragua can be found in Keynan et al. (1997).

A pilot stage of the ATP1 program was initiated in 1995 with 289 producers, organized in 14 groups, and served by 17 extension agents (7 more extensionists joined the pilot at a later stage). Although payment for the service reached only 45% of the agreed upon charges, INTA decided to continue with the program in 1996. During the first agricultural season of 1996 --the *Primera*, 866 producers, organized in 41 groups, signed contracts to receive service. During the second season --the *Postrera*, the number of producers increased to 2,221. Overall, some 35 extension agents were involved with the program during the first season, and 93 during the second. It is worth mentioning that the demand for the service during the second season surpassed INTA's plan by more than 15%, and that payment by producers was close to 80%, as is shown in the next sections of the paper.

As can be seen from Table 2, the number of INTA's extensionists that are involved with ATP1 is increasing, from 24 in 1995 to 78 in 1996, and 93 in 1997. This number is projected to increase to its ceiling value of 120 in 1998 and thereafter. Consequently, the ATPb program is

being substantially modified in order to allow INTA to continue to provide some level of extension to those producers who are unable to pay for extension services.

Table 2: Actual and projected participation and extension personnel in ATP1 1995-1999

	1995 Actual		1996 Actual		1997 Actual		1998 Projected		1999 Projected	
Region	Groups	Producers	Groups	Producers	Groups	Producers	Groups	Producers	Groups	Producers
A1	12	55	43	518	19	445		1990		3370
A2	9	78	101	927	29	244		2170		3142
B3	8	77	94	1179	121	2050		2930		5660
B5	11	46	31	446	81	1205		1665		3000
C6	5	33	41	417	62	523		1760		3450
Total	46	289	310	3473	312	4477	525	10515	930	18622
Extensionists	24		78		93		120		120	
Groups/Extensionist	1.9		4.0		3.3		4.3		7.7	
Producer/Extensionist		12.0		44.5		48.1		80.3		124.1

Source: Garcia, 1997b.

Figure 3 presents the participation trends during the first two years of ATP1's existence, while Table 3 presents recovery rates of producers' payments for extension. The exponential growth in the number of producers (and groups) that joined ATP1 is explained by the "over capacity" of extension agents in INTA's regional offices that could absorb growing number of producers. However, given the present capacity--both professional and managerial--of INTA, these trends will decrease over time if INTA does not increase its professional and managerial capacities.

Figure 3: Participation in ATP1 in the first two years, by agroclimatic seasons

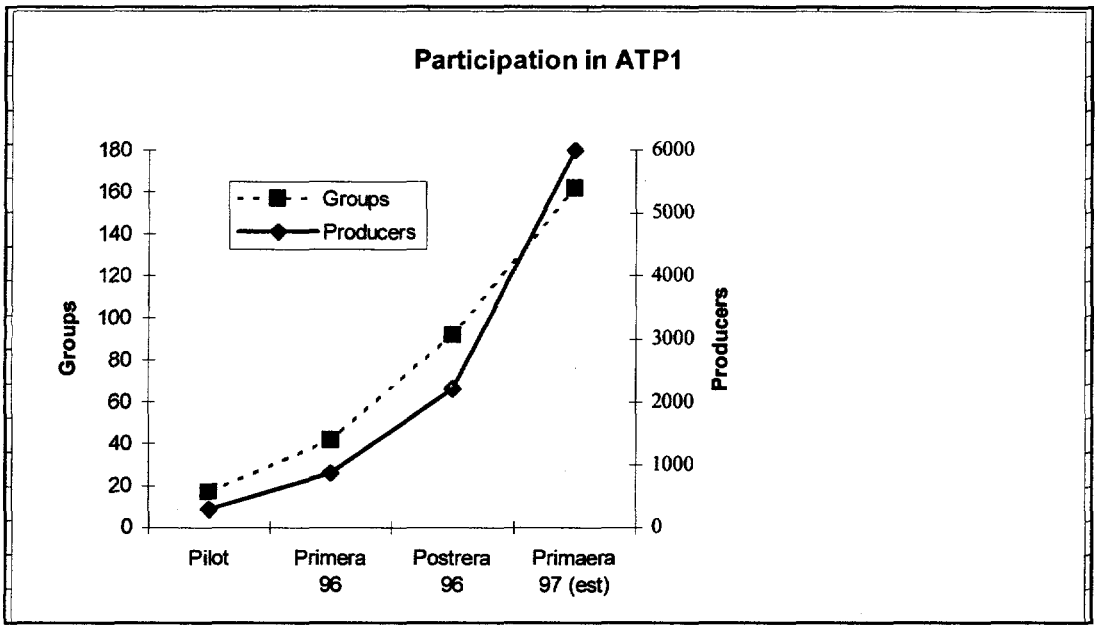


Table 3: Producers' agreed upon, and actual payments, and payment rates for ATP1 services

Region	Payments (Cordobas)					
	Postrera 1995 by 6/30/96			*Primera* + *Postrera* 1996 by 1/30/97		
	Agreed upon	Actual payment	% paid	Agreed upon	Actual paymen	% paid
A1	3258	1457	44.7	23260	12170	52.3
A2	2056	1594	77.5	18742	11561	61.0
B3	3970	2820	71.0	34108	27675	81.0
B5	1410	1410	100.0	5225	1908	36.0
C6	1061	158	14.9	N/A	N/A	N/A
Total	11755	7439	63.3	81335	53314	65

Source: for *Postrera* 1995: Keynan et al., (1997); for *Primera* and *Postrera* 1996: Garcia, (1997a).

Note: N/A= Not available.

The Private Agricultural Technology Transfer Service (ATP2)

In order to continue the diversification of its services, in mid-December 1994 INTA invited a number of private firms to jointly assess the possibility of providing private technical assistance to small and medium producers. The use of private firms to provide agricultural technology transfer services was enhanced by the need to: (a) use market incentives to provide better services; (b) minimize the risk of a larger public bureaucracy; and (c) reduce the costs to the public sector through a cost-sharing scheme by which the clients would participate in the financing of the service. During the first years of this program, most of the costs are expected to be covered by the government through a loan from the World Bank.

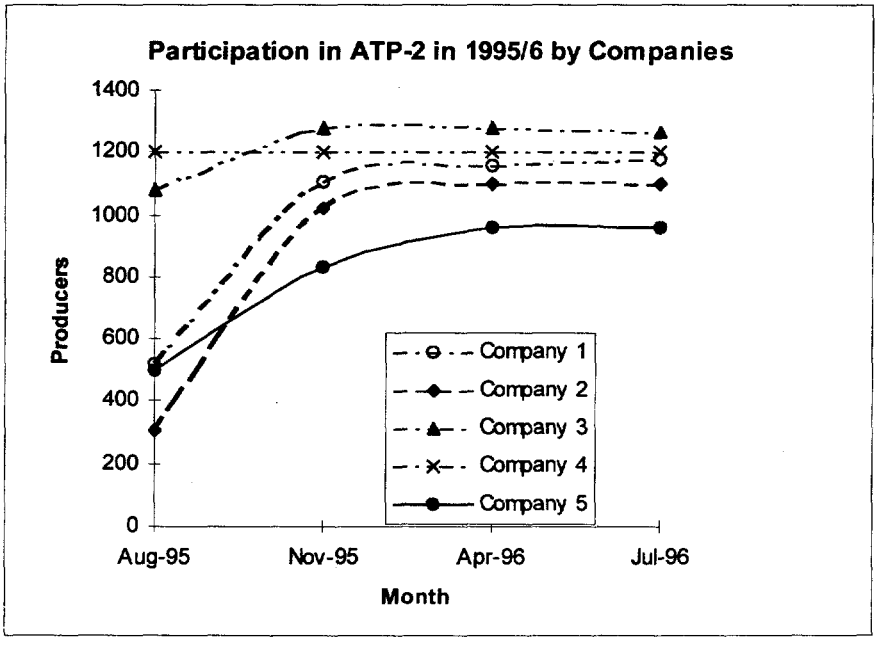
After several months of demand evaluation, the first contracts --between producers, the government, and private firms--were signed in August 1995. According to these tripartite contracts, the producers were expected to pay a sum covering about 20% of the cost in the first year, and their contribution is expected to increase to nearly 80% in about five years. At the time of writing, no producer was paying more than 50% of the service provision costs. An estimate of the average cost of public extension provision in Nicaragua (based on INTA budget for 1995), suggests a direct cost per producer of $115/year. This estimate appears to be quite high compared with actual data for ATP1 and ATP2, as can be seen from the analysis in this paper. Producers in five regions were organized in groups and by end-July 1996 some 5,700 producers were served by 46 technicians and 7 supervisors contracted by 5 firms (each firm is responsible to provide extension services in a given region).

In contrast to the ATP1 concept, the service in ATP2 covers a wide range of farm production and marketing aspects. The size of the groups varies between 10 and 20 people. Each technician serves between 8 and 10 groups and attends between 100 and 150 producers. Figure 4 provides the participation trends in ATP2 during the first two years of the program. Contrary to the trends in ATP1, it can be seen in the case of ATP2 that each private company reached its ceiling quite fast (1 to 2 seasons, and in one case in the first season). This result is directly related to the government assessment of each company's capacity, and its decision to allow the company to provide extension services to a given amount of producers. Given this regulatory rule, firms

attempt to maximize their proceeds by approaching as many producers as possible, until they reach the ceiling imposed by the government.

In the first stage of the work, the company's technician together with the producers prepared diagnostics of the situation on the farm, identified existing problems, and provided alternate solutions to upgrade production efficiency. Jointly with each producer, a production plan and a training program were designed. This service is coordinated by a very small unit within INTA. The main tasks of the unit are to administrate the activity and to guide its implementation.

Figure 4: Participation patterns in ATP2 by private extension companies in 1995-1996



Note: Two more companies (# 6 and 7) were contracted and joined ATP2 in 10/1996.

Although the ATP2 concept is based on the participation of producers in the cost of the service provision, the selection of producers whose performance levels are not satisfactory may create problems in the recuperation of producers participation payments. This was the case in the first season of ATP1's operation (Auguset 1995). As a result of non-careful selection of participant producers, their performance was not satisfactory, leading to objections about paying for the service on their part. In the following seasons, farmers were recruited more carefully, accounting for certain professional skills to allow better implementation of extension recommendations. By

the end of 1996, 85 percent of the producers paid their fees, and by the end of 1997, 7 firms provided extension services to more than 13,000 producers through 102 private technicians and collected 81% of the producers fees (2 firms joined in 8/97). Table 4 presents cost recovery rates by producers for the 7 private companies for the first and second years of ATP2's operation. In light of the increasing number of producers--that creates logistical problems of fee collection, the cost-recovery values of 81% on average (with a range between 64%-96%) are quite impressive. The drought conditions that affected coffee production, a major crop in certain regions, accounted for relatively low recovery rates for companies 2 and 5.

As correctly indicated by one reviewer, there is a potential problem of bias in the analysis if producers are selected for participating in paid-extension programs. In such case the impact of paid extension does not reflect real world distribution of producer ability and real willingness to pay. However, for an undertaking such as paid-extension departing from a heavily subsidized public extension, a selection approach such that was chosen in Nicaragua is fully justified.

Table 4: Rates of producers payments by companies in ATP2

Company	**Recovery of extension fees**			
	First Year (8/95-7/96)	**Second Year (8/96-10/97)**		
	Recovery rate (%)	**Billing (Cordobas)**	**Actual payment (Cordobas)**	**Recovery rate (%)**
1	87	391,007	367,546	94
2	87	331,828	212,866	64
7	N/A	180,049	237,187	82
6	N/A	142,255	148,360	86
3	83	254,548	237,187	93
4	85	278,865	267,710	96
5	84	477,420	320,893	67
Total	85	2,055,973	1,677,472	81

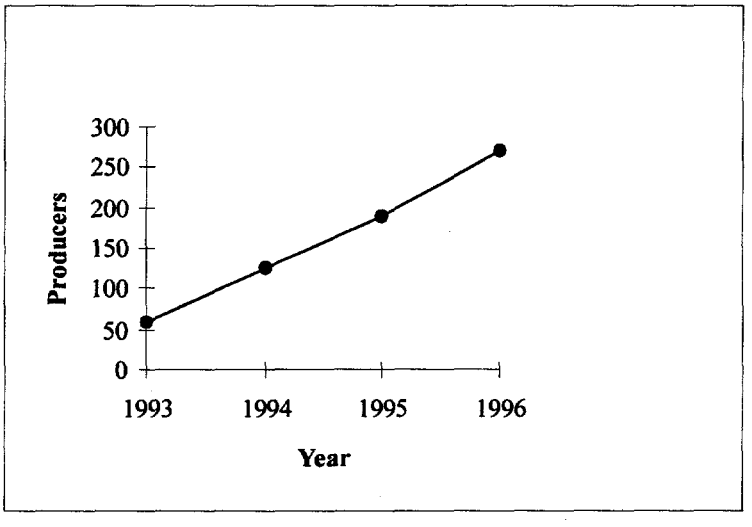
Source: Estrada-Rizo and Garcia (1997) for the period 8/95-7/96, and Estrada-Rizo (1997) for the period 9/96-10/97.

The Basic Public Extension Service (ATPb)

Although not directly the focus of this paper, ATPb is an extension program that will play an important role in the political agricultural arena. Bearing in mind that of the total population of more than 200,000 agricultural producers, only 40,000 are approached by the three ATP programs, and only 25,000-30,000 will be contacted through ATP1 and ATP2 by 1999. In order to reach the big producer population that is not approached through ATP1 and ATP2, policy makers will need to enhance, and diversify the coverage of ATPb.

Data on ATPb in Nicaragua became available from a study by ESECA (1997) based on 270 representative sample farms. Some of the information in that study can be used in conjunction with the performance indicators suggested in the previous section. Figure 5 shows participation trends of producers in ATPb between 1993 and 1996.

Figure 5: Participation in ATPb in the sample of the study by ESECA (1997)



Source: Based on data from ESECA (1997a)

Measuring Paid-Extension Costs and Performances in Nicaragua

In this section we will apply the analytical procedures that were presented earlier. First we will use some of the findings of ESECA (1997) to derive several performance measures. Without distinction between extension programs (see footnote) in the sample of the study by ESECA (1997),

most producers (94%) applied the recommendations provided by extensionists. Of those applying the recommendations, 19% reported a 100% effectiveness, 61% reported 50 to 75% effectiveness, and 20% reported 25% effectiveness. Two more measurements of value of extension are the evaluation of INTA's technical assistance (ATPb+ATP1) and the change in producers' income as a result of that advice. Of the sampled producers, 43% and 50% ranked the service as "very helpful" and "helpful", respectively. Forty one percent of the sampled producers reported an increase in their income, 47% reported stable income, and 12% reported a decline in income. These indicators, although not comprehensive in nature, provide some insight on the impact of INTA's technical assistance.

Although at this stage it is still impossible to distinguish between ATPb and ATP1 producers in the ESECA (1997a) sample, some interesting hypotheses can be stated. Table 5 shows that of the sampled producers, 25% were contacted once a week, 50% were contacted every fifteen days, and the rest (25%) were contacted between every three weeks and every three months.[10] Under conditions in Nicaragua, producer contacts was dependent on the level of accessibility to the producers, especially after heavy reainstorms that wash away roads. Thirty two percent and 27% of the producers were not accessible all year round by car and by motorcycle, respectively.

Table 5: Number of visits by extension agents in the ATPb and ATP1 programs

Frequency of visits (days)	7	15	21	30	45	60	90
Share of population (%)	25	50	3	12	1	3	1

Source: ESECA, 1997a

[10] An interesting question is what characterizes the producers that are more frequently contacted. Additional finding is that 26% of the sampled producers paid for their extension services and 74% got it for free. Forms of delivery of recommendations are also split at the same rate. 29% received written recommendations, 68% received verbal recommendations, and 3% received recommendations in other forms. A hypothesis for verification is that those producers paying for the service were also visited once a week, and given written recommendations. Producers paying for the extension belong probably to the ATP1 program. If this is true, then it would be easy to compare between the performance of the extension agents and the producers in the co-financed program and in the traditional public extension program.

Measuring the Performance of ATP1

We will apply several measurements that utilize available data in order to demonstrate various aspects of ATP1's performances and impact. We start with applying a simple farm-level analysis to data available in the *Primera* 1996 season in order to estimate the gross incremental benefits associated with ATP1 technical assistance. Although this measurement can be the result of many other factors, it is an indicator that ATP1 has had a positive impact on producers' incremental incomes.

Obviously the highly positive result in B3 and the highly negative result in A2 dominate everything else in Table 6. As a result, the "average" incremental gross margin of Cd 74,344 is not as robust as it could be. Our main objective in using these one-season-specific performances is to demonstrate the use of one particular indicator in evaluating paid-extension activities.

Table 6: Performance of ATP1 producers in various regions in Primera 1996 (Cordobas)

Region	Incremental income	Incremental cost	Incremental gross margin
A1	8843	2460	6383
A2	-455159	8613	-463772
B3	699010	157178	541832
B5	-8485	1614	-10099
Total[a]	244209	169865	74344

Source: Computed from Garcia, 1996
[a]Not including region C6 for lack of data.

One indirect measure of the performance of extension is the rate of stability of the producer groups in the program. It is expected that a higher rate of instability (measured by the share of farmers/groups discontinuing their participation) is a reflection of a lower rate of satisfaction and a lower rate of extension performance. However, many random events such as unfavorable weather conditions may also contribute to low performances. Table 7 presents data which compares the results between 1995 and 1996.

Although all the numbers in the right column of Table 7 suggest a low rate of stability of the groups participating in ATP1, this can be explained by the relatively early stage of the program (second year), and by the inappropriate procedure for selecting the farmers in the various groups. However, the high level of farmer and group substitution in ATP1 is associated with the high transaction costs of establishing new groups and re-assigning of new farmers to existing groups. These transaction costs are to be borne by the extensionists who assemble the groups. These factors should be taken into account when analyzing ATP1's performance.

Table 7: Continuation rate of groups participating in ATP1 between 1995 and 1996.

Region	Number of Groups	Groups Continuing	% of Groups Continu-
A1	43	8	18.6
A2	101	22	21.8
B3	94	35	37.2
B5	32	3	9.3
C6	41	2	4.8
Total	311	69	22.2

Source: Garcia (1996)

Recent data for seven ATP1 extension-providing companies allows a three-year perspective on the stability of producer-participation (INTA, 1998). Of the total 15,587 producers contracted for 1997/98, 26% are three year veterans, 39% are two years veterans, and 35% are new participants in the program. These figures indicate a better long-term stability of producer participation. Indeed, such analysis should be done, using long-term and aggregated data in order to provide sensible results.

In calculating the cost of extension provision in ATP1, we use actual data available for technical assistance programs in INTA (Estrada-Rizo and Garcia, 1997). These estimates are presented in Table 8.

It appears from Table 8 that the annual average cost per extensionist in the technical assistance programs (ATPb and ATP1) is $3612. Figure 6 suggests that about 70% of these costs

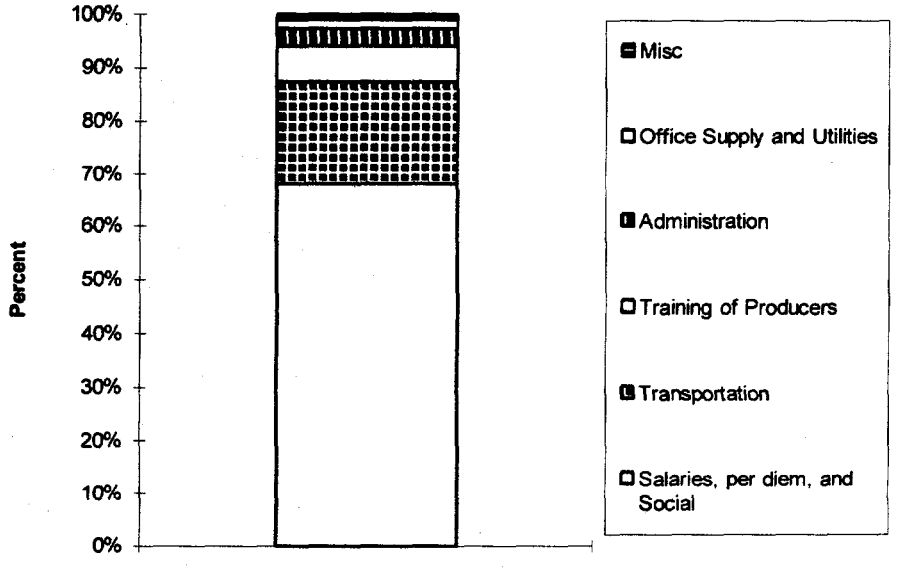
are for salary, 20% are for transportation, 5% are spent on producer training activities, and the rest (5%), are for administration, utility and other miscellaneous costs.

Table 8: Monthly ATP1 and ATPb extensionist cost in 1997

	Units per month	Cost per unit ($US)	Monthly cost ($US)	
Fixed costs				
Salary	1	178	178	
Fuel	20 gallons	2.4	48	
Maintenance of vehicle	1	10	10	
Per diem	20 days	1.33	27	
Sub-total				263
Variable cost				
Stationary and office supply			10	
Training			20	
Electricity and water			5	
Taxes, rents			1	
Insurance			2	
Sub-total				38
Total per month				301
Total per year				3612

Source: Estrada-Rizo and Garcia (1997)

Figure 6: Share of main components in extension provision cost (ATP1) 1995-97



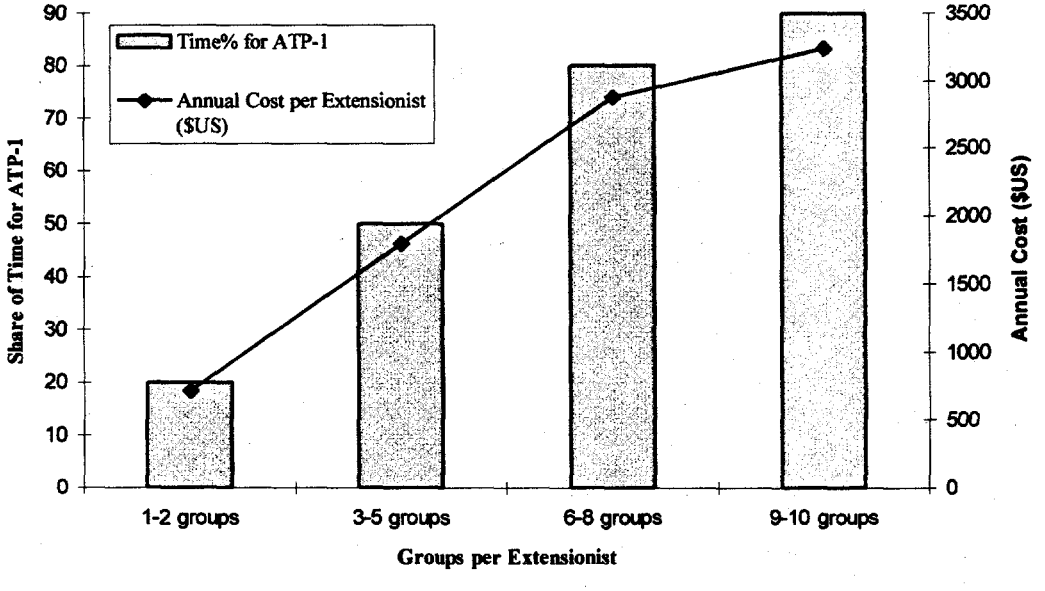
In order to calculate the cost of providing extension in the ATP1 program, and also to derive the cost of providing extension to an individual producer in ATP1, we can use estimates made by Estrada-Rizo and Garcia (1997). Table 9 presents these estimates, and Figure 7 derives the cost per extensionist that is associated with ATP1 activities.

Table 9: Allocation of extensionist time and fuel cost between ATPb and ATP1 clientele

Percent of time and fuel allocated to ATP1 activities			
Number of ATP1 groups contacted by extensionist			
1-2	3-5	6-8	9-10
20	50	80	90

Source: Estrada-Rizo and Garcia (1997)

Figure 7: Annual cost and time share for technical assistance (ATP-1 and ATPb) as a function of the number of groups per extensionist.



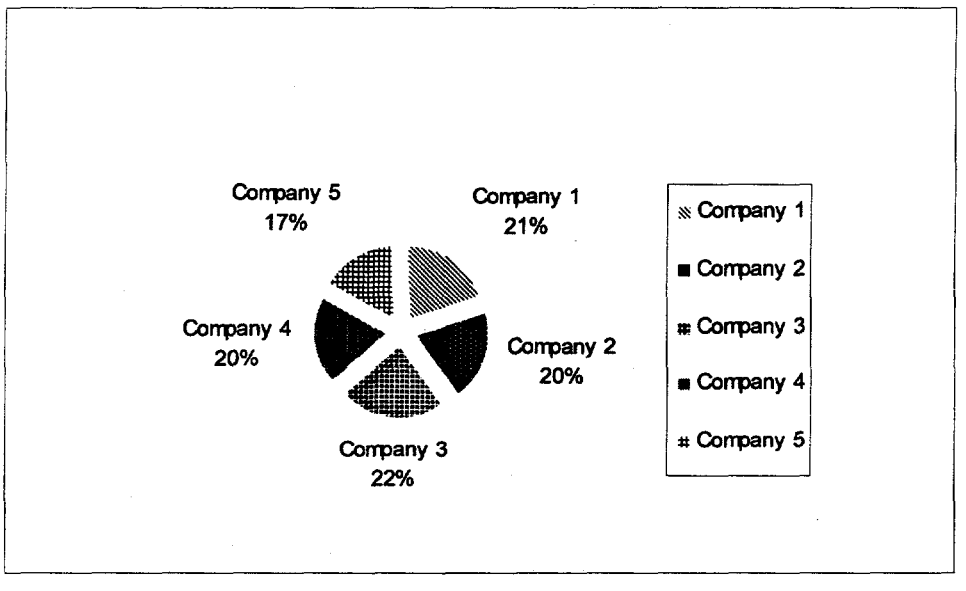
Based on the data presented so far, it is possible to estimate the cost of providing ATP1 extension services to producers. In 1995-1997 the number of producers per group was approximately 11. Therefore, the cost per producer, as a function of the number of groups per extension-

ist varies between $66, in the case of 1 group per extensionist, and $30, in the case of 10 groups per extensionist.

Measuring the Performance of ATP2

In the case of ATP2, there are several private companies that provide extension services to producers that are contracted individually, but are also arranged in groups, such as in the case of the ATP1 program. In November 1997, there were seven private companies providing extension services, but data on financial reports of the companies are not available for 1997. In May of 1996, there were five private extension companies operating in Nicaragua. Figure 8 provides their market share in the producer population.

Figure 8: Market share of the various private companies participating in ATP2 in Nicaragua (1996)

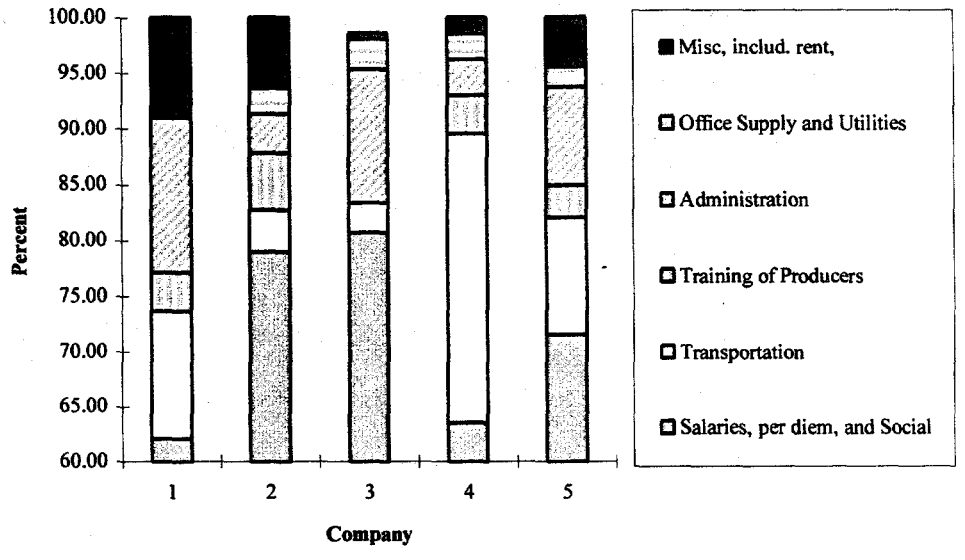


Source: Based on financial statements submitted to the coordinating unit in ATP2.

In 1997, with the addition of two more companies, the market shares for the seven extension-providing companies were 13.7, 17.2, 13.4, 13.5, 12.7, 16.7, and 12.8 percent for companies 1, 2,7, 6, 3, 4, 5, respectively (INTA 1998). In 1997 as in 1996, the market share of the private extension-providing companies remains more or less equal.

We were able to calculate the cost of ATP2 extension provision from the financial reports of the 5 private companies for the period 8/95-8/96. The share of the major cost components in the extension provision cost are presented in Figure 9.

Figure 9: Share of major components in extension provision cost of 5 ATP2 companies



As can be seen from Figure 9, salary is the main component in the cost of extension provision, varying greatly among the companies. Transportation cost is also a relatively important cost component that varies among the companies, mainly because of location issues. On the average, 72% of the costs was spent on salaries, 10% on transportation, 3% on producer training activities, and the rest (15%), was spent on administration, utility and miscellaneous costs.

Comparison of the cost share between ATP1 and ATP2 provides some interesting results. Salary cost and expenditures on producer training are strikingly similar, around 70% and 5%, respectively. Transportation cost share in ATP1 is doubled compared with ATP2 (20% and 10% respectively), and administration cost are tripled in ATP2 compared with ATP1 (15% and 5%, respectively). These two differences can be explained on the ground that (1) private companies in ATP2, unlike public agencies in ATP1, have more flexibility in selecting their clientele, also based on location, so their transportation costs are minimized, and (2) the administration costs in private

companies include rent to their managers, which may increase this component in the budget, relative to ATP1.

The financial performance of the five ATP2 companies is presented in Table 10. The calculated average gross margin is nearly 25%, which indicates a sustainable level of profit. However, one company has a very low level of performance (8%) that is mainly explained by a low level of producer fee collection.

Based on the data in Table 10 and Table 12, the per producer cost of extension provision by ATP2 varies between $53 and $77 per year. This range is not too far apart from the estimated cost (between $30 and $66) of extension provision by ATP1, that was calculated earlier.

Another aspect of the financial status of the private companies that provide extension services to producers under the ATP2 program can be found in Tables 11 and 12 below.

Comparison of the private firms data in Table 11 suggest major differences in resource allocation for visits of farmers. While firm 1 allocates 24 working days per month for each extensionist, of which 83% (≅20 days) are spent on producers' visits, firm 5 allocates 22 working days per month for each extensionist, of which 77% (≅17 days) are spent on visits. Other interesting results are the big variation between the firms in both technician training and office work. If data on producer performance is available at the extension provider level, It could be used to estimate more accurate efficiency differences among the firms.

Table 10: Financial performance of five private companies in the period 8/95-6/96

Item	Company 1	Company 2	Company 3	Company 4	Company 5
Income from INTA	646583.97	613707.98	713207.76	626676.56	621872.28
Income from Producers	127957.48	153466.99	170061.60	180000.00	142162.12
Income from Other Org.	9045.86	0.00	N/A	N/A	N/A
Other Income	1229.62	0.00	1378.24	N/A	N/A
Total Income	784816.93	767174.97	884647.60	806676.56	764034.4
Total Operational Expenses	721893.73	543592.82	697144.33	525279.62	572100.85
Gross Margin (share)	0.08	0.29	0.21	0.35	0.25
Cost of extension per producer (Cd)	499.57	677.79	489.91	467.33	595.93
Cost of extension per producer ($)	56.76	77.02	55.67	53.10	67.71

Note: Based on an exchange rate of 8.8 Cd per 1$US in June 1996
N/A means not applicable

Data available from INTA (1998) for seven extension-providing companies indicates a range of cost of extension provision for 1997/98 that varies between $70.98 and $88.43 per producer, based on the company. The average cost for 1997/98 of $79.67 is significantly lower than that of 1996/97 ($88.83), and that of 1995/96 ($101.18). The cost effectiveness trend over the last three years of ATP2 operations is a reflection of both the experience gained by the private companies, and by the competition regulated by INTA.

Table 11: Extensionists' allocation time for extension in the 7 private companies of ATP2 as of 10/1996

Company	Number of Technicians	Working Days per Month	Distribution of Technicians' Time among Activities							
			Visits of Producers		Technician's Training		Office Work		Misc.	
			Days	%	Days	%	Days	%	Days	%
1	10	24	20	83.3	2	8.2	1	4.2	1	4.2
2	7	24	20	83.3	2	8.3	2	8.3	-	-
7	6	23	18	78.2	2	8.7	2	8.7	1	4.4
6	8	24	20	83.3	3	12.5	1	4.1	-	-
3	11	22	18	81.8	1	4.5	2	9.1	1	4.5
4	10	22	18	81.8	2	9.1	2	9.1	-	-
5	8	22	17	77.3	2	9.1	3	13.6	-	-

Another trend worth-mentioning is the producer payment schedule. First-year participating producers pay 20% of the extension cost; second-year participating producers pay 30% of the cost, and so far, third year participating producers pay 50% of the cost. This schedule is expected to reach 100% cost recovery in five to eight years. Finally, the total cost of the extension provision in 1997/98 will be borne as follows: producers 31.7%, the government of Nicaragua 18.5%, and a World Bank loan 49.8%.

Table 12: Extension provision situation for the 7 ATP2 private companies as of 9/1997.

Company	Number of *"Departmentos"* Served	Number of Municipalities Served	Number of Local Communities Served	Clients as of 9-30-97	% of Clients continuing from last year	Number of Extensionists	Number of Groups	Groups per Technician	Producers per Technician	Clients as of 12-31-96
1	2	10	82	1710	69.4	13	105	8.1	131	1445
2	3	15	92	2333	25.8	25	97	3.9	93	802
7[a]	1	6	83	1200	N/A	8	83	10.4	150	1423
6[a]	2	6	39	1294	N/A	8	63	7.9	156	1124
3	2	5	49	1078	58.8	8	63	7.9	135	960
4	1	3	63	1344	70.4	9	63	7	149	880
5	1	4	47	1200	60.0	10	100	10	120	421
Total	12	49	455	10159	40.2	81	574	7.1	125	7055

Source: Estrada-Rizo (1997).

[a]Operational from 10-96.

So far the data available also allows a comparison some indicators between ATP1 and ATP2. For example, it seems that the work load on ATP1 and ATP2 extensionists is similar. While in 1995-1997 ATP1 extensionists were responsible also for ATPb activities (and therefore, impossible to compare their workload), it is envisioned that in 1999 they will only be engaged with ATP1 programs. Therefore, the projected indicators of ATP1 for 1999 (groups per extensionist, and producers per extensionist) in Table 2 while compared to that in Table 13 for ATP2 suggests a similar work load measured in the number of producers per group, and number of groups per extensionist.

With all the available data at hand, it is possible to calculate meaningful benefit-cost indicators, as was suggested in the analytical framework section. We present such analysis for one ATP2 company (#4) in Table 13. As can be seen from the table, the private cost benefit ratio is higher than the social one, not taking into account the government subsidy to the companies. The indicators also do not include opportunity cost associated with terminating the existing ATPb program. Once the costs of the enhanced ATPb program considered by the government are available, it would be possible to calculate a revised benefit cost ratio.

Table 13: Social and private benefit-cost ratios for a representative ATP2 extension firm in a given region (Cordobas)

Value of production	Direct cost of production	Gross margin	Producers payments for extension	Transfer to firm by government	Private cost-benefit ratio	Social cost-benefit ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		(1)-(2)			(3)/(2)+(4)	(3)/(2)+(4)+(5)
30,393,420	16,375,867	14,017,553	180,000	626,676	1.835	1.769

Source: Servitec S.A. (1996)

Conclusions and Policy Implications

As a growing number of governments privatize their extension services, there is a pressing need to establish procedures for paid extension evaluation, and to compare both cost and performance of public vs. private services, and among various private services. This paper develops and applies a framework aimed at measuring cost and some performance indicators of paid-extension.

Although paid-extension is being discussed for many years among extension and public policy experts, economic data on this subject is difficult to obtain. The data available from two types of paid-extension programs in Nicaragua for the last 3 years, provides important ground-breaking information, which can augment our understanding of private extension services.

There are several issues to be derived from the available information from Nicaragua:

1. Improvement of the services provided with paid-extension compared to public extension. One of the objectives of paid-extension is to improve service to producers. Although the data is insufficient to compare public vs. paid-extension quality of service, it is apparent from the increasing and stable participation figures, that producers are satisfied with the service. Future investigation should focus on identifying producer satisfaction levels.
2. Cost effectiveness of the service. It appears from the available data that extension provision costs are both lower and decreasing over time. This variable of extension cost has a direct bearing on both the quality of service by the extension agency/company, and the ability and willingness to pay by the producers. The optimal level of extension provision cost needs to be determined on the basis of the long-term objectives of the system and the original level of producer production. Substitution between high extension costs and high performance levels is a subject for further investigation. In the case of Nicaragua, the estimated extension cost for ATP1 are lower than those for ATP2 ($30-60 compared with $50-70). This difference can be explained by the number of producers per extensionist (in 1996 it was 58 and 125, respectively for ATP1 and ATP2). Indeed, ATP1 is aiming at increasing the number of producers per extensionist by moving away from providing ATPb extension services. These services will be provided using a mass media approach (ATPm).

3. Cost recovery of the service. Cost recovery rates as reported for ATP1 (63%-65% in 1995/96) are lower than those for ATP2 (81%-85% in 1996/97), but still, both programs indicate cost recovery rates that are at the same level as in other countries (e.g., Netherlands--see footnote 7). Cost recovery is an important aspect of private extension. Although we witnessed relatively high rates, it would be desirable to increase cost recovery to 100%, in order to continue providing these services and to ensure that they are not affected by budget cuts.

It appears that the principle of private decision makers equating the value of extension services to the cost of such services works even in a poor country such as Nicaragua. Once they realize their full potential, producers are prepared to pay for information and knowledge. Although too early to conclude, it seems that the two paid extension systems in Nicaragua achieved the objectives of improving extension services, and of increasing agricultural production and producer profitability. However, there are several fundamental policy questions that could be researched further:

1. the distribution of the paid-extension benefits among different classes of producers is an important question, affected by the payment method (e.g., per farm, per visit or per unit of land);
2. the impact of paid-extension on the poor and on subsistent producers, who may be left out, unable to pay for the service, when public extension is replaced by paid-extension;
3. the social cost of non- or alternative extension methods to substitute public extension for the poor and subsistent producers.
4. the long-term sustainability of paid extension in developing countries needs to be re-examined once external funding for paid-extension projects are gone, and to check the effectiveness of mechanisms to ensure their self sustainability.

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